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Some Notes on Chromogenic Bacteria

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NAIADACEÆ.

Potamogeton natans L.
Lake Okoboji (Hitchcock).
P. lonchites Tuck.
Spirit Lake (Hitchcock).
P. praelongus Wulf.
Clear Lake (Hitchcock).
P. perfoliatus L. var. *Richardsonii*, Bennett.
Lake Okoboji and Spirit Lake (Hitchcock).
P. zosterifolius Schum.
Lake Okoboji (Hitchcock).
P. mucronatus Schrad.
Spirit Lake (Hitchcock).
P. pectinatus L.
Woodbine (Burgess); Lake Okoboji (Hitchcock)

CYPERACEAE.

Cyperus diandrus Torr.
Near Lake Okoboji (B. W.).
C. Schweinitzii Torr.
Lake Okoboji (B. W.).
Eleocharis acicularis R. Br.
Sioux City (B. W.; L. H. P.).
Scirpus lacustris L.
Council Bluffs (L. H. P. observations); Sioux City (B. W.).
S. atrovirens Muhl.
Sioux City (B. W.).

Species of Carex numerous, but omitted because they have not been studied critically. There are also a large number of grasses, localities and species will appear in another connection.

SOME NOTES ON CHROMOGENIC BACTERIA.

L. H. PAMMEL AND ROBERT COMBS.

Quite a large list of chromogenic bacteria are known to bacteriologists. Many of these are familiar objects in bacteriological laboratories. Of the early works describing these in this country we may mention Sternberg and Trelease. For later works on North American chromogenic bacteria we must refer to Sternberg, Jordan and the numerous text books dealing with pathogenic species.

Very few attempts have been made to study our local bacteriological floras. It is indeed a very difficult matter.

The following works describe Chromogenes:

Saccardo: Sylloge Fungorum VIII.

Sternberg: Manual of Bacteriology. 1892.

Trelease: Observations on several Zoogloea (Studies Biol. Lab. of the Johns Hopkins University). 1885.

P. & G. C. Frankland: Micro-organisms in Water. 1894.

Adametz: Die Bakterien der Trink-und Nutzwasser. Mitth. der Oester Versuchstation fur Brauerei-und Malzerei in Wien, 1888. Heft 1.

Jordan: A report on certain species of bacteria observed in sewage. Rep. Mass. State Board of Health, 1888-1890, plate II.

Eisenberg: Bakteriologische Diagnostik. 1888.

Welz: Bakteriologische Untersuchnyer der Freiburger Luft, Zeiritschrift fur Hygiene XI, p. 121.

No attempt will be made to give description of common species found here at Ames, simply a record of their occurrence including some laboratory observations.

Micrococcus cyanogenus. N. SP.

Source.—During the latter part of May, 1894, a foreign blue color was observed on an old milk culture of an organism obtained from cheese; later the same was found in an old milk culture of *Bacillus aromaticus.* A transfer from the first milk tube was made to another tube of sterilized milk, the typical color appearing in three or four days. The organism was separated by pouring plates of agar.

Morphology.—A small micrococcus occurring singly or in groups; motility not determined. An aerobic liquefying micrococcus.

Agar.—Nearly colorless, with a slight tinge of blue, producing an irregular film on surface, growing at temperature of room.

Gelatin.—A creamy white layer not spreading on surface, soon liquefying, forming a funnel-shaped area, later the medium was liquefied with a creamy white sediment in the bottom of the tube.

Milk.—Sterilized milk inoculated produces in three days a slight blue layer on surface, which increases in intensity, becoming quite blue for one-third of an inch on the seventh day. On the eighth day it appeared rather muddy; on the ninth day only a faint blue color remained; it coagulated milk with a

blue liquid on top. The curd was dissolved slowly. In twenty-five days the process was completed, excepting a small portion in the bottom of the flask.

Dunham's peptone solution.—No color produced; the medium became cloudy, which was in no way characteristic. It failed to grow in Dunham's rosalic acid solution.

Several blue organisms have been described.

Bacillus cyanogenus is a well known inhabitant of milk. This is a non-liquefying, actively motile bacillus. Has not been found here at Ames. Gessard has shown that in presence of an acid it produces an intense blue color, and in milk not sterilized containing lactic acid germs, a sky blue color is produced.

Jordan has also described a *Bacillus cyanogenus*, which is less motile forming a deep brown color on potato, but he says undoubtedly *Bacillus cyangenus.* Beyerinck[2] has also described a blue organism obtained from cheese, the *Bacillus cyaneo-fuscus.* The original paper has not been seen but according to the description given by Sternberg this is a small bacillus 0.2-0.6 u. long and one half as thick. It is an aerobic liquefying motile bacillus, and when cultivated in a solution containing one-half per cent of peptone the culture media acquires at first a green color, which later changes to blue, brown and black. Subsequently the color is entirely lost. More recently Wm. Zangemeister[3] has described a bicillus cyaneo-fluorescens.

This species is in many respects similar to *Bacillus cyanogenus.*

It is however somewhat shorter and very actively motile.

Gelatin is not liquefied and the bright greenish fluorescent pigment diffuses through it.

Our species also came from cheese and the blue color disappears, but the organism in question never produces a black color. The species so far as we have been able to determine is new, and we have therefore given it the name of *Micrococcus cyanogenus.*

Staphylococcus pyogenes, Ogston var. *aureus* Rosenbach.—This, the most common of the pyogenic micrococci has been found quite frequently here at Ames. It has at different times been isolated from ordinary carbuncle, fistula, dirt under the finger nails, etc. It has been found more commonly in suppurative abscesses than any other organism. It is pathogenic to mice

[2]Sternberg: Manual of Bacteriology p. 727.

[3]Kurze Mittellungen uber Bakterien der-blauen Milch. Centralblatt f. Bakt. u Parsitenkunde. Erste Abt., XVIII, p. 321.

and rats. Old cultures, however, soon loose their virulence. A culture nine months old failed to cause any lesions in mice, not even the local formation of pus.

St. pyogenes, Ogston var. *citreus* Passet.—This species has not been found spontaneously in any of the cases of pus studied, though it has been cultivated in the laboratory. It has been included with the pyogenic cocci because of its occurrence in pus. Passet found the organism in the pus of an acute abscess and Sternberg[4] says: "As to its pathogenic properties, we have no definite information. It is included among the pyogenic bacteria because of occasional presence in the pus of acute abscesses, although it has heretofore only been found in association with other micro-organisms." Mice have been inoculated here at Ames but in no case did fatal septicæmia follow. We have, however, had no trouble in obtaining pus at the point of inoculation under the root of the tail. From this pus, pure cultures of the organisms were obtained.

St. pyogenes Ogston var., *flavescens* Trev.—Obtained from the fistula of a horse by Dr. S. Whitbeck in bacteriological laboratory, Iowa Agricultural college. This organism does not differ from the foregoing in size; in color, however, it is much paler, being an ochre yellow. It produces fatal septicæmia in mice when fresh cultures were used, but in this case pure cultures were not obtained.

Streptococcus cinnabareus, Flügge.—Obtained at first from butter, but probably came either from the air or water. Color in different media is quite constant, except in blood serum, where its color is much paler. It grows quite characteristic on the surface of bouillon, forming spherical masses paler than in agar or potato. A nearly related species was isolated by Dr. W. B. Niles from the heart of a diseased steer affected with corn-stalk disease. It differs from the cinnabarcus in the change of color. It is dark lemon-yellow at first, and then changes to a brick-red. This species will be described in another connection.

Sarcina lutea Schröter.—This well known organism occurs chiefly in the air. Gelatin and agar plates exposed to the air invariably show this organism. It comes up somewhat more tardily than the non-chromogenic species. They appear as small, yellow, spherical colonies. The canary-yellow growth liquefies gelatin quite slowly. The same organism has been

[4]Manual of Bacteriology p. 273.

obtained frequently from butter and milk, but the organism undoubtedly came from the air.

S. aurantiaca Flügge.—This organism is also quite commonly met, and appears on gelatin and agar plates exposed to the air.

Bacillus fluorescens liqaefaciens Flügge.—This common inhabitant of water also occurs on potato, milk and butter. Scarcely a sample of water can be plated without obtaining this organism.

B. pyocyaneus Gessard.—This has been obtained several times from wounds and Dr. S. Whitbeck obtained a pure culture in open synovial bursa. Inoculation into the peritoneal cavity was followed by death in forty-eight hours. In old cultures there is a gradual tendency for the organism to lose its power of forming coloring matter. Gessard[5] has isolated two pigments a fluorescent green and a blue, the latter called pycoyanin.

Bacillus prodigionsus Ehrenberg.—This species is well known to most bacteriologists. It has long attracted attention because of the red stains produced on potatoes, boiled bread, and the red color it imparts to milk. According to several investigators this organism is not a native to this country.

The species is however, recorded at Ames by Bessey. He commonly obtained a red organism on sliced potatoes exposed to the air.

There are of course several red organisms and as the organism was reported before the era of modern bacteriological methods I must therefore express some doubt as to the correct determination of the Bacillus prodigiosus found by Bessey. The senior writer has at various times had cultures of this organism in the laboratory. Thus we had good growing cultures in 1889, 1892, but all attempts to make old cultures failed. In 1894 a blood-red colony came up in culture plate. Cultures of this organism had never been in this laboratory so far as we know. In the spring we had received from Dr. Irving W. Smith, cultures of several species obtained from the laboratory of Johns Hopkins University. The cultures appeared pure but they may have been contaminated. The senior writer observed this organism on one other occasion in the botanical laboratory of the Shaw School of Botany, St. Louis. Cultures of *B. prodigiosus* were obtained from rotting sweet potatoes, but European cultures were common at the time in the labora-

5Gessard. De la pyocyanine et de son Microbe. These de Paris, 1882. Nouvelles recherches sur la Microbe pyocyanique. Ann. d l'*Institut Pasteur*. Vol. IV, 1890, p. 89

6Bull. Dept. of Botany, Nov. 1884.

tory. Professor Trelease thought it probable that the species came from the European cultures. We are therefore inclined to believe with Jordan, Russell, and others that the species is not native in this country.

FUNGUS DISEASES OF PLANTS AT AMES, IOWA, 1895.

BY L. H. PAMMEL AND GEO. W. CARVER.

In previous papers record has been made of the abundance of parasitic fungi for the years of 1891, 1892, 1893 and 1894.[1] We hope to continue these observations for the purpose of making comparison.

Observations from year to year with climatic conditions should make it possible to say how much climate modifies the appearance of disease. Observations in a climate like ours are valuable because of the changeable conditions as to humidity and rainfall. From the nature of the diseases of plants it is difficult to make exact statements. We must speak in relative terms. In 1893 *Puccinia graminis*, *P. rubigo-vera* and *P. coronata* were very destructive. In 1894 these rusts were not absent, but they were not destructive; in fact, scarce as compared with 1893.

In the study of diseases of plants the condition of the atmosphere with reference to moisture is an important factor. The universally low humidity of the atmosphere in 1894, no doubt, largely determined the amount of rust that year. So low was the humidity that during the growing season dew was an unusual condition.

We append table, giving rainfall, relative humidity, 7 A. M. temperature (maximum and minimum), for the months of May, June, July, August and September, taken from the records made at Ames by Dr. J. B. Weems, Mr. W H. Heileman.

[1] L H. Pammel, Jour. Mycology, VII, p. 95.
Agricultural Science, VII, p. 20.
Proc. Iowa Academy of Science, II, p. 201-203